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Hospital Oxygen Backup System (HOBS)

Operation and service manual (793460-001)

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Introduction

1.0 Safety

1.1 Cylinder Handling and Safety

2.0 Cylinder Shipping

3.0 Ventilation

4.0 Personal Protective Equipment

5.0 Site Selection

6.0 Setup and Installation

7.0 Pre-start Check

8.0 Cylinder Filling

9.0 HOBS Vacuum Procedure

10.0 Special Tools

11.0 Maintaining valves and fittings

12.0 Equipment Breakdown for Transport

APPENDIX A: Drawing package

Introduction-**Hospital Oxygen Backup System** (HOBS)

The HOBS unit consists of a four legged stand assembly with a manifold unit for grouping up to eight "H" size Oxygen cylinders. The purpose of the HOBS is to provide a backup Oxygen source for use in the hospital. The HOBS unit is capable of supplying (8) hours of backup Oxygen at the predetermined flow-rate. The HOBS is a totally passive system with no moving parts or power requirements. The HOBS unit is fully compatible with all Oxygen generating and hospital equipment manufactured by Pacific Consolidated Industries

1.0 **Safety**-Regardless of the properties of the gas, any gas under pressure can explode if the cylinder is improperly stored or handled. Improperly releasing the gas from a compressed gas cylinder is extremely dangerous. A sudden release of the gas can cause a cylinder to become a missile-like projectile, destroying everything in its path. Cylinders have been known to penetrate concrete-block walls. To prevent such a dangerous situation, there are several general procedures to follow for safe storage and handling of a compressed gas cylinder:

1.1 **Safe Use of Compressed Gas Cylinders**-Compressed gases present several hazards. Labels on the cylinder and the Material Safety Data Sheet (MSDS) supplied with the gas tell you about the hazardous properties of the gas; such as toxic, flammable, or oxidizer. In addition to the gas hazards, compressed gas cylinders pose other hazards simply because they contain gas under pressure.

1.2 Cylinders shall be stored in an area specifically designated for that purpose.

1.3 This area shall protect the cylinders from being struck by another object. The area must be well-ventilated and away from sources of heat.

1.4 This area shall be at least 50 feet away from highly combustible materials.

1.5 Oxidizers must be stored at least 50 feet away from flammable gases.

1.6 Cylinders must not be dropped or allowed to fall. Chain and rack all cylinders in an upright position during use and storage.

1.7 Never permit cylinders to contact live electrical equipment or grounding cables.

1.8 Cylinders must be protected from the sun's direct rays, especially in high-temperature climates.

1.9 Before the cylinder is used, install the proper pressure-reducing regulator on the valve.

1.10 After installation, verify the regulator is working, all gauges are operating correctly and that all connections are tight to ensure that there are no leaks.

1.11 When you are ready to use the gas, open the cylinder valve with your hands. Never use a wrench or other tool.

1.12 If you cannot open the valve with your hands, do not use the cylinder.

2.0 **Cylinder Shipping**-The following practices shall be observed when moving/transporting (pressurized) cylinders

2.1 Do not ship leaking, corroded or noticeably damaged cylinders

2.2 Do not ship cylinders on their side (always in upright position)

2.3 Do not ship cylinders without the cylinder caps in place.

2.4 Do not lift cylinders by the cap

2.5 Do not roll or drag cylinders

2.6 Do not remove or alter cylinder markings

2.7 Cylinders under pressure shall be labeled as such

2.8 Cylinders shall be shipped and stored using the (3) point contact method

2.9 When transporting cylinders, they must be secured at all times.

2.10 When moving a cylinder, even for a short distance, all the valves must be closed, the regulator removed, and the valve cap installed.

2.11 Never use the valve cap to lift a cylinder. If you are using a forklift or some other lifting device to move a cylinder, use a cradle or boat designed for that purpose.

2.12 Never use a sling or a magnet to move a cylinder.

2.13 If cylinders are shipped in an enclosed container ensure that there is adequate ventilation.

2.14 Vents shall be at or near the floor line

2.15 Do not use cylinders while in motion or while vehicle engine is running

3.0 **Ventilation**- The normal Oxygen content of air is (21%), this percentage may be increased by a gradual or sudden addition of pure Oxygen (for example, due to leakage from a connection, line or fitting, or even from the normal functioning of a safety relief valve.

3.1 Air with a high Oxygen content causes combustible materials to more readily ignite, and to burn much more rapidly. Even seemingly insignificant factors such as the friction at a valve seat or stem packing produced when turning a valve may cause ignition.

4.0 **Personal Protective Equipment (PPE)**-The level of PPE shall be determined by the inherent dangers present relative to the task being performed.

4.1 As a minimum safety glasses and or face shields shall be worn working with high pressure systems (HOBS)

4.2 Additional PPE will be dependant upon relative operations performed in conjunction with the operation of the HOBS

4.3 When selecting PPE all potential hazards in the immediate work area should be a consideration (electrical, LOX, extreme temperatures, etc.)

4.4 The atmosphere around the unit could have an enriched oxygen atmosphere. For this reason clothing must be clean and free from hydrocarbons due to the risk of combustion.

5.0 **Site Selection**-The site selection for the HOBS, as well as the related Hospital equipment shall be carried out by the individual responsible for the hospital setup. This will allow the equipment to be placed in the optimum position, with careful attention to be paid to the point at which the power is taken from the distribution system.

5.1 The area should be flat and firm, with sufficient space around all equipment and the HOBS manifold for operation and maintenance. All hospital equipment to include the HOBS shall have a suitable escape route to allow operators to evacuate the area should an incident occur.

5.2 The equipment shall be located away from any roads, vehicles or similar sources of hydrocarbons.

5.3 The equipment area shall be restricted from free access by unauthorized personnel.

5.4 No open flames or smoking shall be allowed within 50 feet of the unit.

5.5 The area should be kept clean and free from trash and debris due to the increased fire hazard.

5.6 Units requiring power within the hospital configuration shall be connected to a power supply that can be remotely shut off in case of a unit fire. The power supply and means of isolation should be clearly marked.

5.7 The route on which cylinders are to be transported should be as smooth as possible to minimize the risk of damage to cylinders. If the ground is uneven or has a loose surface a walkway should be laid.

5.8 The unit should be shaded if high temperatures are expected, and protected form the environment whenever possible

5.9 If a high pressure cylinder is punctured the area must be evacuated immediately and no attempt must be made to restrain the cylinder.

5.10 The release of oxygen into the atmosphere increases the risk of combustion and can result in some materials becoming self combustible. No hydrocarbons or flammable materials are to be stored within 50 feet of the unit.

5.11 The HOBS should be positioned for ease of access for cylinder changes and should not block the escape route from the unit.

6.0 **Setup/Installation**-To be performed by trained personnel following the procedure below.

6.1 The HOBS shall be erected ensuring that all locking pins are in position. The length of the supply hose from EDOCS to HOBS should be checked to ensure the hose will not cause a trip hazard. The hose should NOT be connected at this point. The HOBS erection procedure is as follows:

6.2 Remove the retaining pins inside the crate.

6.3 Using the lifting bars at either end, remove the HOBS and place on the ground, use packing to ensure the HOBS is not resting on any regulators, valves or hoses.

6.4 Locate the numbers on the frame and identify the corresponding legs.

6.5 Lift the manifold end of the unit and position the legs in place and secure with the quick release pin. Ensure the HOBS are not pivoting on any valves or hose when lifted.

6.6 Lift second end and position the legs in place and secure with the quick release pin.

6.7 Adjust the legs until square, then connect the cross members with the quick release pins.

6.8 Fit the center crossbars and secure with the quick release pins.

6.9 The (4) cylinders as a minimum that are to form the reservoir on the HOBS are to be moved into position and secured in place with the supplied chains.

6.10 The cylinder should be placed on the four corners to assist with stability of the HOBS. The cylinders should NOT be connected at this point.

6.11 Any shading should be erected and moved into place, the shading should be checked to ensure the unit is covered through the hottest part of the day. Once the shading is in the correct position it should be firmly secured in place.

7.0 **Pre-start Check**-After the HOBS has been erected the following steps shall be performed:

7.1 The unit should be inspected for any signs of damage, if any is found the unit shall not be placed into service until the required maintenance has been performed.

7.2 Check all gauges for serviceability.

7.3 Ensure that all hand valves are fully functional.

7.4 Inspect all lines and fittings for evidence of corrosion or damage.

7.5 Ensure all valves on the HOBS are in the closed position; these should have all been closed on the previous shut down.

7.6 Inspect the high pressure oxygen hose for damage and ensure both quick release couplings are in place and undamaged.

7.7 DO NOT adjust the Pressure Relief valves at the rear of the HOBS manifold but inspect for corrosion or damage.

7.8 Slowly open the vent valve on the HOBS manifold to vent any pressure within the manifold. Once vented, close the vent valve.

7.9 Before connecting all cylinders, crack open then immediately close the cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles.

7.10 Connect the cylinders that will form the HOBS reservoir to the four corner manifold pigtails, ensure that the valves on the cylinders are closed.

7.11 Before connecting the pigtails, inspect that the connection threads are serviceable and undamaged.

7.12 Connect the pigtails securely, do not over torque the fittings.

Warning: Only oxygen cylinders are to be filled; filling non oxygen cylinders may result in a catastrophic explosion

8.0 **Cylinder Filling**-All cylinders shall be inspected to ensure that they are undamaged and within their hydrostatic inspection date.

8.1 The (4) cylinders should be fitted to the four corner connections of the HOBS (up to 8 cylinders may be connected). The pressure within the cylinders shall be a minimum of 50psig; this can be checked as follows:

8.1.1 Ensure that HOBS manifold valves V – 1, V – 2, V – 3, V – 4, V – 5, V – 6, V – 7, V – 8,V – 9, V - 10 and V- 11 are closed. This isolates the manifold from the supply. For each cylinder in turn:

(1) Open cylinder valve.

(2) Open manifold valve for cylinder.

(3) Test the seal around the connection using oxygen leak detector fluid (if not available use a mild solution of water and detergent); if leaking tighten by hand, if the leak continues do not use the system until appropriate repair has been completed.

(4) Read the cylinder pressure from manifold pressure gauge PI-2.

(5) Close the manifold valve and the cylinder valve.

(6) Vent the pressure in manifold by opening manifold vent valve V-2.

(7) Once the manifold pressure is vented, close the manifold vent valve V-2.

8.2 If any cylinder has less than 50psig, it will require that a vacuum be performed prior to use.

Note: See section 6.0 for HOBS Vacuum procedures.

8.3 If all the cylinders have more than 50psig they may be filled from the EDOCS.

8.4 First the cylinder pressures must be equalized; this is achieved by the following:

(1) Open all the cylinder valves.

(2) Slowly open the HOBS manifold valves (with the cylinders attached) one at a time and allow the cylinder pressures to equalize.

(3) Once the pressure has equalized, open the HOBS manifold valves (with cylinders attached) fully.

(4) Test the seal around the connection using oxygen leak detector fluid (if not available use a mild solution of water and detergent).

(5) Repair all leaks prior to system use.

8.5 Once the cylinder pressures have been equalized they can be filled by connecting the high pressure oxygen hose to HOBS fill – high pressure and opening HOBS valve V - 1.

8.6 The HOBS cylinders will fill at a rate of 66 liters per minute (from the EDOCS) therefore the HOBS reservoir cylinders could take up to 24 hours to fill.

8.7 Once the cylinders on the HOBS are filled, they will give a reservoir that can be used to decant oxygen into other cylinders.

8.8 Only 93% Oxygen cylinders are to be filled using the EDOCS-120, they should be marked with an adhesive label identifying them as having been EDOCS-120 re-filled. 100 % oxygen cylinders should not be filled with the EDOCS. Never fill cylinders that are not designed and marked for oxygen storage.

8.9 The cylinder filling speed must be controlled to ensure valve icing does not occur due to the rapid expansion of gas.

9.0 **HOBS Vacuum Procedure**-The procedure for vacuuming cylinders using the HOBS manifold is as follows:

9.1 Isolate the HOBS reservoir cylinders by closing the HOBS manifold valves and the cylinder valves as high pressures will destroy the vacuum gauges and vacuum pump.

9.2 Remove the high pressure oxygen hose from the HOBS using the quick release coupling.

9.3 Ensure all HOBS valves are closed, DO NOT adjust the Pressure Relief Valve's at the rear of the HOBS manifold.

9.4 Close all cylinders that do not require a vacuum (leave the previously isolated HOBS reservoir cylinders connected).

9.5 For all cylinders that require vacuuming, slightly open then close the cylinder valve to clear the nozzle of any possible debris, be aware of the hazard caused by the high pressure gas and particles.

9.6 Ensure all cylinders have a seal and that it is serviceable, or the sealing threads are in a serviceable condition.

9.7 Connect all cylinders requiring vacuuming to the relevant connection points.

9.8 Open all of the respective cylinder valves for the cylinders that require vacuuming.

9.9 Open the HOBS vent valve V-2 this will open the manifold to atmosphere.

9.10 Slowly open HOBS manifold valve for each cylinder to be vacuumed, until all cylinders have been vented to atmosphere.

9.11 The pressure must be fully release before going any further. Confirm the pressure has been released, by checking HOBS pressure gauge PI-2.

9.12 Open HOBS manifold valve V-1.

9.13 Start the vacuum pump using switch SW - 1, the vacuum pump should be heard running.

9.14 The vacuum pump should be drawing air through HOBS vent valve V-1, to start drawing a vacuum on the cylinders close HOBS vent valve V-2.

9.15 Observe the vacuum strength on the EDOCS-120 (caboose) pressure gauge PI-4; this measures the vacuum in inches of mercury.

9.16 Once the vacuum reaches 25 inches of mercury, the vacuum pump should be stopped using switch SW - 1.

9.17 Isolate each cylinder by closing the cylinder valve and the relevant HOBS manifold valves. Close the HOBS manifold valve V-1.

10.0 **Special Tools**-Tools contaminated with hydrocarbons can ignite if exposed to high concentration of oxygen; this could occur during maintenance and therefore should not be carried out by operators.

10.1 All tools used on the HOBS shall be specifically designated for Oxygen service only.

10.2 All tools and equipment used for oxygen service shall be of a material or design (usually Brass) which may be safely exposed to oxygen (no oil filled gauges); no other tools are to be used.

10.3 Do not use any form of solvents which is not oxygen compatible to clean the tools or equipment.

10.4 The Oxygen compatible tools and equipment shall be stored in an area free from contaminants when not in use.

Warning: Do not use common tools on Oxygen equipment. Use only non-sparking tools, which are usually made of bronze or brass.

11.0 **Maintaining valves and fittings**- All valves and fittings shall be inspected prior to each use of the HOBS.

11.1 Any leaking valve or fitting must be replaced if the leak is not repairable.

11.2 To correct a cylinder valve leak follow the steps below:

(1) Close the cylinder valve and the individual manifold valve.
(2) Disconnect the pigtail from the cylinder
(3) Relocate the cylinder to a suitable maintenance area.

Warning: Always stand to the side while loosening the safety nut or plug in case it should blow out.

(4) Loosen the safety nut or plug to allow any gas contained in the cylinder to vent.
(5) After the gas has vented remove and inspect the safety nut or plug.
(6) Repair or replace as necessary.

11.2 Use only the proper parts/rebuild kits to repair leaking valves.

11.3 Maintain Oxygen cleanliness throughout the maintenance procedure.

11.4 When parts are removed for maintenance the ports must be capped or covered to prevent possible contamination.

11.5 Any valve or fitting that appears damaged or corroded shall not be used until it has been properly tested/function checked and repaired as necessary.

Warning: Do not attempt to make repairs to systems under pressure.

12.0 **Equipment Breakdown for Transport**

Note: This operation shall be accomplished by (2) personnel as a minimum.

12.1 Close all of the cylinder Valves.

12.2 Disconnect the braided stainless-steel high pressure hose (EDOCS-120).

12.3 Disconnect the braided hoses at the fittings outside the hospital and return them to their respective cases (PODS or SSODS).

Note: If both PODS and SSODS were in use, dismantle and pack each system separately to avoid mixing the components.

12.4 Open the HOBS manifold vent valve to remove any remaining manifold pressure.

12.5 Remove the pigtails from the cylinders at the CGA540 connection.

12.6 Install the plug assemblies into the CGA540 connections to prevent contamination.

Warning: be careful not to drop the cylinders or let them hit against one another or any other objects. Do not place cylinders in apposition where they may roll or be accidentally knocked over.

12.7 Remove the securing chains one at a time, remove the "H" cylinders and relocate the cylinders to a safe location.

12.8 Remove the retaining pins, and remove the middle crossbar.

12.9 Remove the retaining pins, and remove the support bar from between the legs.

12.10 With an assistant holding up one side of the frame, remove the retaining pins, then remove the legs from one side.

12.11 Lower the frame to the ground and remove the retaining pins and legs from the other side.

12.12 Place the HOBS manifold assembly in the provided transport case, ensuring each assembly is in the proper location.

APPENDIX A